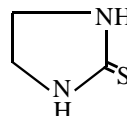


ETHYLENE THIOUREA

Ethylene thiourea is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 96-45-7

Molecular Formula: $C_3H_6N_2S$



Ethylene thiourea occurs as white to pale green needle-like crystals with a faint amine odor. It is very soluble in hot water; slightly soluble in cold water, methanol, ethanol, ethylene glycol, pyridine, acetic acid, and naphthalene; and insoluble in acetone, ether, chloroform, and benzene. When heated to decomposition, ethylene thiourea emits toxic fumes of nitrogen oxides and sulfur oxides (NTP, 1991).

Physical Properties of Ethylene Thiourea

Synonyms: 2-imidazolidinone; 1,3-ethylene-2-thiourea; 4,5-dihydroimidazol-2(3h)-thione; 2-imidazolidinethione

Molecular Weight:	102.17
Melting Point:	203 - 204 °C
Log Octanol/Water Partition Coefficient:	-0.66
Water Solubility:	9 g/100 ml at 30 °C
Conversion Factor:	1 ppm = 4.18 mg/m ³

(HSDB, 1991; Merck, 1983; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Ethylene thiourea is used in electroplating baths, as an intermediate for antioxidants, in insecticides and fungicides, in vulcanization accelerators, dyes, pharmaceuticals, and synthetic resins (Sax, 1987). Ethylene thiourea is also a photolytic degradation product of ethylenebisdithiocarbamate fungicides (HSDB, 1991). The primary stationary sources that have reported emissions of ethylene thiourea in California are electrical services, manufacturers of motor vehicles and equipment, and gas production and distribution services (ARB, 1997b).

B. Emissions

The total emissions of ethylene thiourea from stationary sources in California are estimated to be at least 410 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Ethylene thiourea is not known to occur as a natural product (HSDB, 1991).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of ethylene thiourea.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of ethylene thiourea was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Ethylene thiourea is expected to partition between the gas and particle phases, given its high melting point. In the particle phase, ethylene thiourea is subject to wet and dry deposition (of the particles). The average half-life and lifetime for particles in the troposphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (Atkinson, 1995; Balkanski et al., 1993). No information about the atmospheric persistence of gaseous ethylene thiourea was found in the readily-available literature.

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics “Hot Spots” Program (AB 2588). Of the risk assessments reviewed as of December 1996, ethylene thiourea was not listed in any of the risk assessments (OEHHA, 1996a,b).

HEALTH EFFECTS

Probable routes of human exposure to ethylene thiourea are inhalation and dermal contact (HSDB, 1991).

Non-Cancer: Ethylene thiourea may cause myxedema, goiter, and other effects related to decreased output of thyroid hormone (Sittig, 1991).

The United States Environmental Protection Agency (U.S. EPA) has established an oral Reference Dose (RfD) of 8×10^{-5} milligrams per kilogram per day for ethylene thiourea. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not likely result in the occurrence of chronic, non-cancer effects. The Reference Concentration (RfC) is under review by the U.S. EPA (U.S. EPA, 1994a).

Effects on the thyroid and increased liver weights were observed in studies that chronically exposed rodents to ethylene thiourea in their diet. Ethylene thiourea has been shown to be a potent teratogen in rats orally or dermally exposed, causing central nervous system and skeletal abnormalities (U.S. EPA, 1994a). The State of California has determined under Proposition 65 that ethylene thiourea is a developmental toxicant (CCR, 1996).

Cancer: A study of female workers occupationally exposed to ethylene thiourea reported no increased incidence of thyroid cancers. Increased incidences of thyroid carcinomas and also hepatomas have been observed in rats and mice orally exposed to ethylene thiourea. The U.S. EPA has classified ethylene thiourea in Group B2: Probable human carcinogen (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified ethylene thiourea in Group 2B: Possible human carcinogen (IARC, 1987a).

The State of California has determined under Proposition 65 that ethylene thiourea is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is 1.3×10^{-5} (microgram per cubic meter)⁻¹ (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to 1 microgram per cubic meter of ethylene thiourea is estimated to be no greater than 13 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is 4.5×10^{-2} (milligram per kilogram per day)⁻¹ (OEHHA, 1994).

